# Illinois Department of Transportation

## Memorandum

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| To: | ALL BRIDGE DESIGNERS | 05.1 |
| From: | Ralph E. Anderson | |
| Subject: | Lifting Loops for PPC I-Beams and Bulb-T Beams | |
| Date: | January 26, 2005 | |

Throughout the past two years the Bridge Office has evaluated several aspects of Precast Prestressed Concrete Beams ranging from design details, changes in design code requirements, fabrication procedures and inspection. One of the specific issues identified for needing improvement was the lifting loops. Plant Inspections revealed that there are a wide range of lifting devices used among fabricators, none of which matches the Department's details shown on the plans. The Department has worked with the industry to develop a lifting loop detail which is more fabrication friendly and has also developed new loop selection charts to satisfy the latest PCI design code requirements.

A summary of the significant changes are as follows:

1. The strand selection charts were revised for the lifting loops to reflect the latest reduced design capacity of a strand.

2. The minimum permissible angle of lift was increased from 45 to 60 degrees.

3. A pipe was added around the top portion of the strands in the lifting loop. This helps ensure that all strands are equally engaged during the lifting process and it also helps hold the configuration of the lifting loop for easier fabrication.

4. A note was added to the base sheets requiring a minimum 2 ½ inch diameter lifting pin. The lifting pin helps to prevent localized overstress of the lifting loop strands during handling.

5. The projection above the beam and the radius of the lifting loop were revised. The new geometric configuration is more consistent with the design load path and provides cleaner handling of the beam.

6. The lifting loops were moved further away from the end of the beam to reduce stress concentrations and to relieve fabrication congestion.

7. The strands within the lifting loop are now flared. This provides full embedment anchorage for each strand within the loop and therefore eliminates the need to use reduction factors for multiple strands.

Attached is a new lifting loop figure which is intended to replace the current Figure 1.4.25 of the Prestressed Concrete Manual. Designers are encouraged to implement the new lifting loop design and details on all projects which have not been let; however, all projects beginning with the June 17, 2005 letting shall utilize the new detail. The following Base Sheets have been revised for the new lifting loop details: (PI-4-36; PI-4-42; PI-4-48; PI-4-54; PBT-4-63; and PBT-4-72). They are dated 1-26-05 and may be found in the MicroStation v8 prestressed cell library on the IDOT web site.

We anticipate that the lifting loop design and details for deck beams will eventually need to be upgraded as well; however, this work is dependant upon further testing which will account for reduced embedment depths on these shallower members. Until this testing is completed, lifting loops for deck beams shall continue to follow the guidelines specified in Figures 2.3.35 and 2.3.36 of the Prestressed Concrete Manual.

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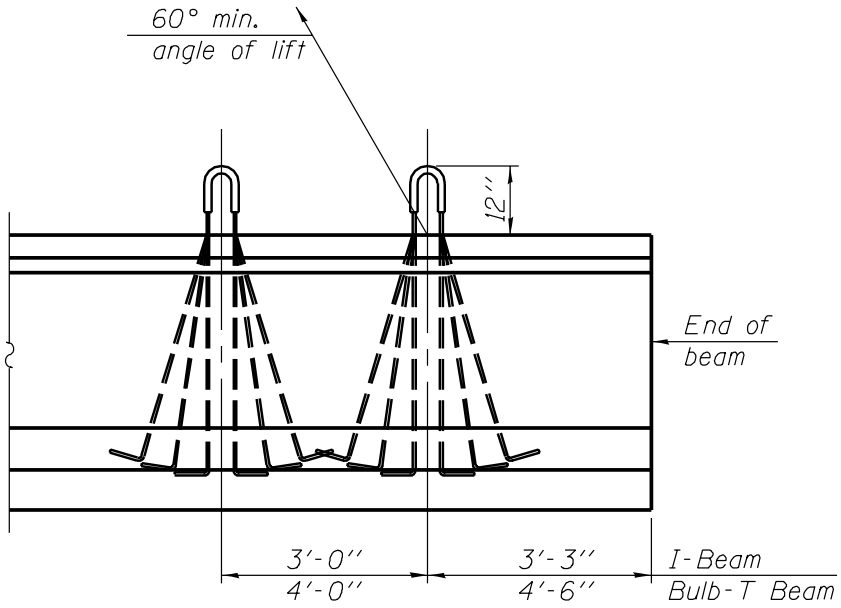



## ELEVATION

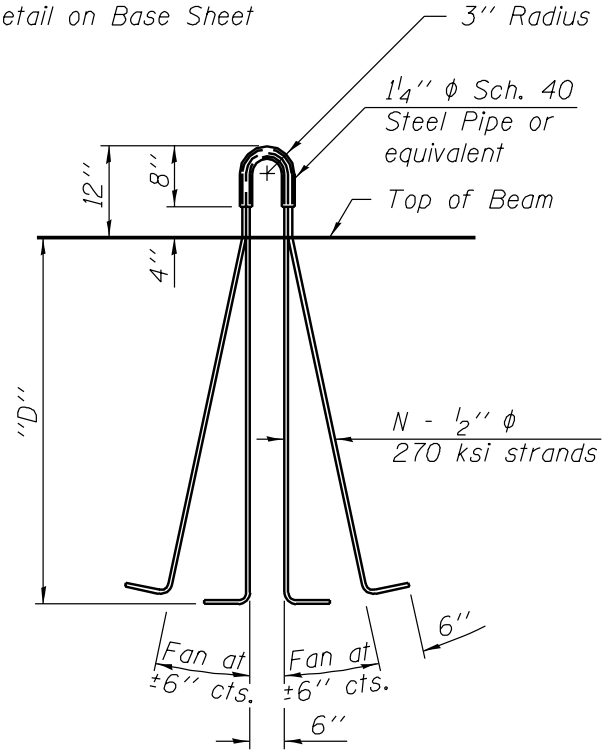
See table for the number of loops and strands per loop required. All lifting loop prestressing strands shall be $\frac{1}{2}$'' $\phi$-270 ksi. Detail on Base Sheet accordingly.

## DESIGN CRITERIA

| PPC Beam | Wt. (Lbs./ft.) | D |
|---|---|---|
| 36'' I Beam | 375 | 2'-6'' |
| 42'' I Beam | 485 | 3'-0'' |
| 48'' I Beam | 595 | 3'-6'' |
| 54'' I Beam | 624 | 4'-0'' |
| 63'' Bulb-T Beam | 743 | 4'-9'' |
| 72'' Bulb-T Beam | 799 | 5'-6'' |

## LIFTING LOOP REQUIREMENTS

| No. of loops each end of beam | No. of strands per loop (N) | Gross wt. of beam (lbs.) |
|---|---|---|
| 1 | 3 | 41,500 |
| 1 | 4 | 55,400 |
| 2 | 3 | 83,100 |
| 2 | 4 | 110,800 |
| 2 | 5 | 138,500 |




## TYPICAL LIFTING LOOP

LIFTING LOOP

Figure 1.4.25